PROJECT FACT SHEET

CONTRACT TITLE: Enhancing the Effectiveness of Carbon Dioxide Flooding by Managing Asphaltene Precipitation

ID NUMBER: DE-AC26-98BC15107

B&R CODE: AC1005000

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PROJECT SITE
CITY: Salt Lake City **STATE:** UT
CITY: **STATE:**
CITY: **STATE:**

CONTRACT PERFORMANCE PERIOD:
9/10/1998 to 9/9/2001

PROGRAM: Supporting Research
RESEARCH AREA:
PRODUCT LINE: RLE

FUNDING (1000'S)	DOE	CONTRACTOR	TOTAL
PRIOR FISCAL YRS	395	35	430
FISCAL YR 1999	30	35	65
FUTURE FUNDS	0	36	36
TOTAL EST'D FUNDS	425	106	531

OBJECTIVE: The goal of this research has three focus areas: (a) thermodynamic and compositional aspects of solids precipitation during CO2 flooding; (b) kinetic aspects of precipitation; and (c) compositional variations in the reservoir over the flood life-time and how they relate to miscibility, precipitation and eventually to flood effectiveness.

PROJECT DESCRIPTION:
Background:
Work to be Performed: 1. Determine conditions at which precipitation occurs in carbon dioxide flooding. Use conditions (pressure, temperature and compositions) relevant in the carbon dioxide flood at the Rangley field operated by Chevron. Measure amounts and compositions of precipitates (High-temperature gas chromatography – mass spectrometry). Develop a thermodynamic model to explain the data. Reconcile the data with what is happening in the well bore (at Rangely) and develop guidelines for better operation. 2. Develop an understanding of issues related to nucleation and growth of asphaltene molecules on surfaces and in homogeneous bulk solutions. 3. Perform core floods at different pressures and reservoir temperature to assess changes in oil compositions with time. Measure time-dependent compositions using GC-MS. Interpret this data in light of the precipitation measurements. Develop a pressure, temperature and composition map of the entire Rangley field being operated by Chevron at various times in the life of the flood (using compositional modeling) and pinpoint possible precipitation or other problems.

PROJECT STATUS:
Current Work:
Scheduled Milestones:
Quarterly and annual reports

Accomplishments: Two oil samples from Chevron's Rangely field were analyzed in detail. The oil from the "non-carbon dioxide" portion of the field contained higher concentrations of light hydrocarbons and higher asphaltene concentrations as well compared to the oil from the "carbon dioxide" portion of the field. With these exceptions, the oils were identical. Temperature programmed cooling of the oils did not yield any solids revealing that precipitation is carbon dioxide induced. Further experiments to observe high-pressure precipitation, NMR and mass spectrometry measurements were streamlined.